How this investigation fits within the “Concept and Lesson Map”:

**Overview for Unit 4**

“Students make observations of the Moon in the sky and notice patterns in the Moon’s cycle of phases. They explore light and shadow and learn that shadows are not just two-dimensional. They use a model to explain the Moon’s phases, and they examine images of phases of the Moon as they seek further evidence for the cause of Moon phases. They create a model to explain what causes eclipses. As a review of the unit or the whole sequence, they evaluate a variety of Impossible Missions.” (GEMS, Space Science Sequence, Introduction, Science Background, Assessment Scoring Guides, page 8)

Overarching question(s) for this whole investigation:

* What are shadows? Why does the Moon appear to change in shape? (4.1 and 4.2)
* Why do we have moon phases and eclipses? (4.3-4.5)

**Attending to “How People Learn”**

How People Learn Key Finding #1: Preconceptions

Eliciting Students Ideas:

Pre-Unit 4 Questionnaire, Session 4.1 Student Sheet: “The pre-unit questionnaires allow teachers to gather information about their students’ possible misconceptions and current understandings of the key concepts in the unit.” See Scoring Guide pages 86-87.

Common Student Preconceptions:

Guidebook for entire kit from GEMS Space Science Sequence, Background, page 41-44

How People Learn Key Finding #2: Facts/Concepts/Knowledge

WA State Content Standards “Science Domains” (EALR 4):

6-8 ES1A The Moon's monthly cycle of phases can be explained by its changing relative position as it *orbits* Earth. An *eclipse* of the Moon occurs when the Moon enters Earth's shadow. An *eclipse* of the Sun occurs when the *Moon* is between the Earth and Sun, and the Moon's shadow falls on the Earth.

WA State Content Standards “Science Domains” (EALRs 1-3):

* 4-5 INQF —Models— A scientific *model* is a simplified representation of an object, event, *system*, or process created to understand some aspect of the *natural world*. When learning from a *model*, it is important to realize that the *model* is not exactly the same as the thing being modeled.
* 4-5 INQG —Explain— Scientific explanations emphasize *evidence*, have logically consistent arguments, and use known scientific *principles, models*, and *theories*.
* 6-8 INQE —Model— *Models* are used to represent objects, events, *systems*, and processes. *Models* can be used to test *hypotheses* and better understand *phenomena*, but they have limitations.

Key understandings for the teacher:

See The Key Concept Wall on page 489.

How People Learn Kay Finding #3: Metacognition

Metacognition: How did my thinking change? What caused the change? How did I come to believe this?

* The post-unit questionnaires allow teachers to gather information about how students’ ideas and understandings have changed during the unit and to measure progress in students learning. See Post-Unit Questionnaire, Session 4.5 Student Sheet, and Scoring Guide pages 88-89. See *The Post-Unit 4 Questionnaire,* page 496.
* See Guidebook for entire kit from GEMS Space Science Sequence, meaning-making discussions, writing prompts and evidence circles.

Evidence of Student Understanding:

Pre and Post Questionnaires, Session 4.1 Student Sheet and Session 4.5 Student Sheet, Scoring Guides pages 86-89.

**Additional Information**

See Teacher Considerations sections (odd numbered pages throughout unit).

Materials and Student Management

* See Teacher Considerations sections (odd numbered pages throughout unit).

Timing Considerations

* See Teacher Considerations sections (odd numbered pages throughout unit).